MORPHEUS

OR

THE FUTURE OF SLEEP

TO-DAY AND TO-MORROW

For a full list of this Series see the end of this Book

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THE FUTURE OF SLEEP

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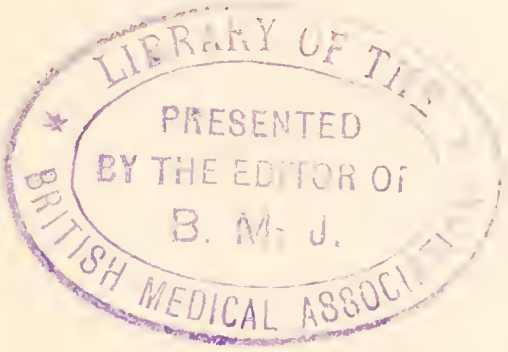

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I

INTRODUCTION

Sleep is one of the world's daily miracles.

When one comes to think of it, it is really very remarkable that once in every twenty-four hours we should lie down in a horizontal position and deliberately become unconscious for the next eight.

We "leave the world to darkness and" the policeman. We cast our responsibilities, ambitions and worries entirely on one side and plunge into a condition of sensory oblivion. We forsake the familiar world of our half-century or so of experience and memories to enter a fantastic world of our own—a realm shared by absolutely no other human intelligence.

This world of dreams has few or no links with that we have just quitted; the few when present are erratic and unpredictable to an amazing degree. Our darkness when illuminated is lit up by a light quite other than the "light of common day", for as Byron said in *The Dream*,

> "Sleep hath its own world,
> A boundary between the things misnamed
> Death and existence."

It might be interesting to discuss what exactly are the conditions leading to healthy sleep, to relate normal with abnormal sleep, to investigate the origin and content of dreams, and finally to forecast the place which will be assigned to sleep in the enlightened community of the future.

The hygiene of sleep is almost as important as that of air or food: it has hitherto not been made a subject of extensive study.

INTRODUCTION

Our daily lives are interpenetrated with references to sleep. We cannot wish our guest greater nocturnal happiness than " sound sleep and pleasant dreams ". We ask him in the morning whether he has slept well. The infant asleep is the incarnation of innocence ; the " sleeping beauty " has a unique charm, and the lover implores the river not to disturb the dream of his beloved. " Flow gently, sweet Afton, disturb not her dream ", sang Burns, greatest of lovers. What more beautifully expressed wishes for a loved one than, " Then dreamless thy sleep or sweet be thy dreams " ?

In the Roman Pantheon, Morpheus, one of the sons of Somnus, was the god of dreams. The word, derived from the Greek " morphe," a form, alludes to forms, shapes or images seen by the sleeper in his dreams. Thus, when the sleep-producing powers of the juice of the poppy were ascertained to reside in a substance extractable from that plant, what more natural name for it than Morphia ?

MORPHEUS

The savage in the remotest ages considered, as does the savage of our own day, that the state of sleep was full of significance. He thought that his soul or spirit actually left his body and travelled in the land of dreams. On awaking, the two were again united. The unphysiologically minded savage of to-day sees a great similarity between sleep and death, the main difference between the two being, for him, that in death the separation of the spirit from the body is final.

II

SLEEP AND SLEEPLESSNESS

Because a thing is very familiar it by no means follows that we know how it comes about. Possibly nothing in life is more familiar than falling asleep, yet comparatively few people could tell us exactly what it is that makes us sleepy and finally permits us to go to sleep.

The English word "sleep" is derived from the Anglo-Saxon "slaepan", sleep, and is akin to the German "Schlaf" and to the Gothic "Sleps". Our word "sleep" always refers to the natural unconsciousness of a healthy person, a condition in which the eyelids are invariably closed, and in which other physiological features are discernible. Some of these will be referred to later on.

When in the course of time the curious condition of artificially induced sleep was discovered amid the chaos of the charlatanism of Mesmer, and a new name was required, James Braid, a Scottish surgeon in India, in 1843 coined for this state of artificial sleep the word "hypnotism" from the ordinary Greek word for sleep, "hupnos". From the original word, "neuro-hypnotism", the "neuro" was dropped, for all sleep is neural in that it belongs to the nervous system. A "hypnotic" is, therefore, a drug which induces sleep.

The medical term for sleeplessness is "insomnia", derived from the two Latin words "in" not and "somnus" sleep.

The fact is that healthy sleep is the result of the co-operation of several conditions or factors, as we may call them. The most obvious thing about sleep is that, while it lasts, we are unconscious, dreaming being a more or less distinct interruption of this unconsciousness. On its mental or psychical side, then, sleep is a regularly recurring state

of unconsciousness, lasting, on an average, about six to eight hours out of the twenty-four. But this unconsciousness is the correlative of a condition of rest—inactivity—of the brain, of its most highly organized portion, known as the cortex cerebri. This cortex cerebri is the physical basis of consciousness, and therefore, when the cortex is active, consciousness is present; when it is completely inactive there is unconsciousness. Partial inactivity is accompanied by imperfect consciousness. Sleep can truly be applied only to the organ of consciousness. Thus decerebrated animals never sleep. No portion of the nervous system below the level of the cortex of the brain can be really said to sleep. The respiratory centre in the medulla oblongata is certainly behaving in its usual rhythmic fashion, else we should not be able to breathe at all. We are certainly not asphyxiated in sleep. The other medullary centres, those for the control of the heart, for the tone of the blood-vessels, for the glands of digestion, are all in

physiological activity although probably not quite so fully as in the waking state.

That the spinal nervous centres are only resting and not "sleeping" is manifest from the fact that reflex actions can be carried out through them. Thieves in India contrive to steal a mattress from under a sleeper by carefully pulling it away from time to time, so that at each disturbance the reflex muscular adjustments result in the body being transferred from the mattress to the ground without the man being awakened.

During sleep *all* the tissues of the body are working less energetically. The heart beats more slowly and less vigorously, the respirations are shallower, the stomach empties itself more slowly, and less urea is eliminated. In consequence of these diminutions in the intensity of the tissue-changes, the amount of animal heat produced per hour during sleep is greatly diminished, as compared with that in the waking state. Roughly speaking, it is only about one-third. (The fall is from 130 calories per hour to 40.)

The animal heat is made mainly in the muscles, so that although in sleep less heat is being produced, it is being lost by the skin at the same rate as before. If we did not get under specially warm bedclothes, we should lose heat so rapidly as to have a dangerous chill. Hence, the risk of people falling asleep without having provided against this loss of heat during their unconsciousness. Death from excessively rapid or long-continued loss of heat is called 'death from exposure'. It is seen in persons immersed in water, in drunken men asleep out of doors or in persons exposed to great cold in the Arctic or Antarctic regions, on high mountains, in the early balloon ascents, and so forth. This is why our bedclothes have to be blankets, things whose bad conductivity for heat conserves our own animal heat.

This inactivity, like the unconsciousness it involves, recurs regularly and, as physiologists say, rhythmically, that is, at regular intervals. The rhythm of sleep is somehow related to the great

cosmic rhythm of day and night, for towards nightfall animals and birds withdraw into the dark and rest, the exceptions being, of course, those creatures of definitely nocturnal habits—lions, cats, jackals, bats and owls, to name no others. A curious instance of this rhythm in regard to sleep is seen in the case of a boy who was abandoned in the streets of Nuremberg at the age of seventeen. His childhood had been spent "in absolute solitude, having no knowledge of men, animals, or plants": he always went to sleep as soon as the sun had set. There is no doubt that man is "intended" to rest his brain and his mind for about one-third of his life; and animals which hibernate or sleep during the winter spend one-half of their lives in repose. It is interesting to remember that in *Utopia* More makes his model citizens spend eight hours in sleep.

Going to sleep is not a matter of choice; we *must* sleep, just as we must eat, to live; and in reality, loss of sleep is more

damaging than loss of food. This has been borne out by experiments on animals, and by the results as observed on men of periods either of starvation or of lack of sleep. Soldiers in the Great War found lack of sleep more trying than lack of food. Sleep is therefore equivalent to some food; a person after the abstention from food during eight hours' sleep is not nearly so hungry as a person who, awake, has not had food for eight hours. This aspect of sleep is well described in *Macbeth*, where sleep is described as "Great Nature's second course, chief nourisher in life's feast".

Puppies deprived of sleep died at the end of five days, although they were taking food, whereas others (controls), allowed to sleep as much as they wished but from which food was entirely withheld, survived to the twentieth day.

The diminution of the tone of muscles, of course, accounts for the familiar fact that when a person goes to sleep in a sitting posture his head falls forwards on his chest. He nods. In ordinary

circumstances a sleeping person can no more go to sleep and remain upright than a corpse placed on its feet can remain erect. In a few unusual circumstances sleep can occur without the balance being upset. Certain of the lower animals are undoubtedly able to go to sleep or into a condition which corresponds to sleep without falling down. This is true of birds and some quadrupeds. Aquatic birds sleep sitting on the water. The stork can go to sleep even on one leg because there is an arrangement whereby the knee-joint is "locked" and so prevented from giving way. The horse, as is well known, can go to sleep in a standing posture. In the lower animals there is doubtless not quite so much diminution of muscular tone as in man. Probably this is to be connected with the fact that their sleep is less deep. Dogs can sleep with one eye open. Zoologists say that guinea-pigs never sleep at all.

Young, immature animals sleep a very great deal; this is probably due to the

fact that in immature organisms the upbuilding of the tissues prevails over disintegration, and this upbuilding in the brain has as its correlative the state of unconsciousness. Processes of repair, rest, restoration after fatigue in the central nervous system all go on during sleep, so that we can understand how damaging to the nervous system must prolonged sleeplessness be. In prolonged sleeplessness the blood and tissues become relatively deprived of water; this causes a thickening of the blood which contributes to the sluggishness of the circulation. The appetite suffers in prolonged insomnia.

Physiologically speaking, sleep is sharply contrasted with death. Sleep is restorative of vitality, death the extinguishing of it. We sleep to wake; we slumber in repose to work better on waking.

Sleep is deepest in the first hour, somewhat less so in the second, and normally much lighter in all the others. This has been investigated by physiologists who have measured the intensity of the sounds or of the electrical shocks necessary to

awaken a sleeper. Because the sleep that is most refreshing is deepest in the first hour, it has been named " the beauty sleep ".

As regards the causes operative in bringing on sleep, the first that would occur to us is fatigue. We cannot sleep if we are not to some extent tired. Sleep due to a healthy degree of fatigue is pleasant, as we are told in *Ecclesiastes* : " The sleep of a labouring man is sweet ". In exactly the same strain speaks Belarius in *Cymbeline* : " Weariness can snore upon the flint, when resty sloth finds the down pillow hard ". Fatigue is, on its material or objective side, a mild blood-poisoning, a toxæmia. During the waking hours certain soluble substances produced by the muscles, by the nervous system, and by other tissues get into the blood, and in traversing the grey matter of the brain, greatly reduce its activity. These chemical fatigue-poisons are supposed to raise the resistance to the flow of impulses over the cells of the grey matter of the brain (cortex cerebri) to such an

extent that the cells cease to be active, and therefore unconsciousness supervenes. Whatever be the exact mode of action of those poisons, there is no doubt at all that extreme fatigue can bring on the most profound kind of sleep known.

We may call this factor in sleep or type of sleep, the *chemical*. As has been said, " we stifle our brain-cells with the ashes of our waking fires ".

There are many examples of sleep of chemical origin through great fatigue. Thus, in the good old days of muzzle-loaders in the " wooden walls ", some of the gun-crew, through sheer exhaustion, would have to lie down beside the guns which continued the cannonade at their very ears.

Sir Philip Gibbs, in his account of the retreat from Mons, thus describes this sort of thing : " Being attacked was the only thing that kept them awake. Towards the end of this fighting they had a drunken craving for sleep, and they slept standing, with their heads falling over the parapet ; slept sitting, hunched

in ditches; slept like dead men where they lay in the open ground. In body and brain these men of ours were tired to the point of death. When called upon to make one last effort after six days and nights of fighting and marching, many of them staggered like men who had been chloroformed, with dazed eyes and grey, drawn faces, speechless and deaf, blind to the menace about them." This is an excellent description of the results of fatigue-poisoning on the brain-cells. It was so profound that the centres for hearing, seeing, and speech were benumbed, as though narcotized.

The late Mr Stevens told us how the camel-drivers in Lord Kitchener's famous forced march to Khartoum, overcome with fatigue, fell from the camels and slept on the sand while the rest of the Army Corps thundered past. Sentries thoroughly fatigued have fallen asleep on their feet and remained standing. Postillions, in the good old coaching days, often fell asleep on horseback and yet rode on in the saddle. We recall that De

Quincey wrote his *Vision of Sudden Death* after having been driven at thirteen miles an hour by a driver fast asleep on the box-seat of a mail coach.

More than once the cross-Channel swimmer, Holbein, has been noticed by the men in the boat to be swimming asleep. A friend of mine, a Colonel of Volunteers, once told me that after undergoing twenty-two hours of extreme fatigue during the Great Volunteer Review at Edinburgh in 1881, he walked home sound asleep for several miles along a familiar road in Fifeshire. This is really not the so-called somnambulism; it is co-ordinated muscular activity during chemically induced sleep. A similar experience is related in Kipling's *Stalky and Co.*: "After that I went to sleep; you can, you know, on the march, when your legs get properly numbed: Mac swears we all marched into camp snoring, and dropped where we halted."

Extreme misery or the endurance of long-continued pain finally brings on sleep. In the good old days of torture,

people used to fall asleep on the rack. These sleep-producing fatigue substances have not been identified by physiologists, although attempts have been made to isolate them. Whatever their exact chemical nature may be, there is no doubt that their action is similar to that of the well-known vegetable alkaloidal poisons, morphine, nicotine, curare, and atropine, substances which interfere with the passing of impulses over the cell units of the nervous system. Hence, there is related to this chemical factor in normal sleep the pathological type of sleep due to drugs—narcosis—whether the drugs be bromides, ether, chloroform, alcohol, chloral, sulphonal, or any of the newer hypnotics.

Lastly, related to this factor of fatigue we have the insomnia from being "too tired to sleep". This sleeplessness may arise from the discomfort or pain arising from the over-exercised muscles, tendons or ligaments, but some of it is due to the fatigue substances having an irritant instead of a hypnotic effect on sensory cells.

Sleeplessness from an excess of fatigue-products in the blood is closely allied to a mild blood-poisoning. This is precisely to what Shakespeare alludes in *A Winter's Tale* in the phrase—"To purge him of the humour that presses him from sleep". The damaging effect which the fatigue-toxins have on the living cells of the brain has been to some extent made clear to us by microscopical research. The central portions (nuclei) of healthy, rested nerve-cells on being highly magnified show the presence of a large number of minute rod-like bodies which can be coloured (stained) of a bright blue or violet colour. It has been demonstrated that if an animal is killed after being extremely fatigued, these rod-like bodies (granules of Nissl) have an abnormal appearance as though they had begun to be absorbed. These observations remove fatigue from the realm of vagueness and bring it within that of histological certitude. There is also partial solution of the granules of Nissl in some other conditions such as alcoholism, epilepsy, and

mania which involve degeneration of brain cells.

The second factor productive of sleep is a negative one, the absence of sensations. Everyone knows we get off to sleep best when we retire into the dark, shut our eyes, and exclude as perfectly as we can the distracting sounds of the outer world. Rarely can we sleep in a bright light or in a noise, or if we are suffering pain ; sensations must be minimized or abolished. As we have just seen, in the sleep of extreme fatigue sensations are disregarded, but ordinary somnolence is favoured by a mild degree of fatigue operating with the more or less complete abolition of sensations.

Any sensory stimulation can keep us awake ; being too hot or too cold, finding the bedclothes too light or too heavy, or, of course, being in pain. Of this nature is the insomnia related to the second type of sleep. Cold feet—our own or someone else's—are a familiar cause of sleeplessness.

The onset of sleep as due to the with-

drawing of sensations is strikingly shown in a case known as "Strümpell's boy". This boy, aged sixteen, living in Leipzig, suffered from the following defects: he was insensitive to touch, he had no sense of smell or taste, he had no muscular sense, no sense of pain, and, finally, he was deaf in the right ear and blind in the left eye. When his left ear was stopped up and his right eye bandaged, he fell asleep in two or three minutes. This negative sensory factor for sleep consists virtually in *not* engaging consciousness with sensory activity.

Now the existence of long-continued, not too intense sensory stimulation comes to the same thing practically as not engaging the attention at all. Thus, monotonous reading or droning preaching ceases in time to engage the attention, and we fall asleep. It is well known that any long-continued sensation which does not change in intensity—contact of our clothes, or the presence of still air at the temperature of the body—ceases to be a stimulus at all. Thus we can sleep

in the rattle of a train or the creaking of a steamer, but as soon as either stops, we wake up. The change from noise to no noise is the stimulus. Hence, a person accustomed to sleep in the din of a city, often cannot get off to sleep the first night in the country, the stillness of the country being by contrast the stimulus itself.

We have an example of the efficacy of monotonous sensations to produce sleep in the recent invention of a vibrating bed. A distinguished traveller having found that he slept so well in the train, had a bed constructed on the principle of vertical vibrations which imitated the vibrations of the train. Here it is the continuousness of the vibration, the very monotony of it which, ceasing to be a stimulus, leaves the brain so tranquil that sleep supervenes. Undoubtedly this factor is operative in the steady, quiet rocking of the cradle.

Very closely allied to the absence of sensation as a cause of sleep is the third factor, the absence of thoughts, emotions,

ideas, in fact any cerebral activities. Everybody knows that anything that is on the mind will prevent sleep, whether it be joy, grief, or an unsolved mathematical problem. Thoughts we cannot banish keep us awake; the tranquillity of a mind at rest, at ease, "at leisure from itself" conduces to sleep. It is the insomnia related to this third factor that is so familiar in the sleeplessness of a "bad conscience", as it is jocularly called. It is mental activity which keeps children awake after their first visit to the menagerie, the pantomime, or to the "Hall of Mysteries". The personal factor here is interesting; some people pass a sleepless night if they know they have to get up earlier than usual next morning; whereas some condemned criminals have slept soundly the night before their execution. As long as the mind is obsessed, sleep is impossible. Sleep means inactivity of the brain, thoughts involve its activity; therefore thoughts and sleep are mutually exclusive.

" Care keeps his watch in every old man's eye,
And where care lodges, sleep will never lie "
(*Romeo and Juliet*).

Wordsworth described this insomnia of the third factor well when he addressed sleep as, " Still last to come where thou art wanted most ". The long-continued sleeplessness of lunatics would come under this head, for it is their mental turmoil, their hallucinations and so forth, that is preventing them from sleeping.

During the course of some researches of Professor Pavlow of Petrograd into what are called " conditioned reflexes " in dogs, a certain curious tendency for the dogs to go to sleep was observed. The experiment was somewhat as follows : dogs were shown meat, and their gastric juice flowed freely at the same time that a bell was rung. After many repetitions of showing the meat and ringing the bell, it was found that the juice would flow if only the bell was rung. Usually, of course, the dog was rewarded by being given the meat. But if after the bell was rung the dog was *not* given the meat

at all, not only did the juice stop flowing, but the animal went to sleep. This is taken as showing that if the supreme interest of the moment is "inhibited" and there is, as it were, for the time being nothing to live for, the animal will go to sleep. It is a case of *absence* of a stimulating mental condition.

We may now inquire into the fourth and last cause of sleep, the diminution in energy of the circulation of the blood through the brain. Functional activity of any part depends on a certain amount of blood being supplied to that part; in health the more blood an organ gets, the more active it is. The brain is no exception; as its blood-supply falls off, its activity is diminished until at last sleep supervenes.

Some of the evidence that the blood-supply of the brain is reduced in sleep is direct. It has been noticed through a wound of its skull that the brain (cortex cerebri) of a dog becomes paler during sleep. Physiologists have trepanned the dog's skull and inserted a

glass window into the aperture. They have noticed that when the dog fell asleep, the surface of the brain not only became paler but receded from the glass, which previously it had pressed upon. Every mother knows that in the infant's head there is a membranous spot (the *anterior fontanelle*) which moves up and down with the same rhythm as the child's breathing. Obviously the more blood in the child's brain, the more will this membrane bulge up. Now it can be seen that this membrane is depressed during sleep and raised during wakefulness. When the child cries, and so prevents the veins from the head emptying their blood easily into the heart, the blood so dammed back causes the fontanelle to bulge upwards.

The retina in the interior of the eye is a part of the brain ; if the retina be examined with the ophthalmoscope by someone who is familiar with the blood-supply of the eye of a waking person, it will be found in sleep to be distinctly paler.

The rest of the evidence is more indirect, but to the physiologist equally cogent. The Italian physiologist, Mosso, contrived to make a man go to sleep balanced accurately on a plank or table arranged like a see-saw; as the man fell asleep, the end of the table where the feet were dipped down through an angle corresponding to the weight of about 260 cubic centimetres of blood. Evidently this is due to a redistribution of the blood, there being now relatively less at the head end and more at the feet end of the body.

This redistribution of blood during sleep may be studied in yet other ways. We all know that the skin is flushed in sleep, noticeably so in children and in persons with transparent skins—hence, the "sleeping beauty"; but this means that if now the skin holds more blood, the brain is holding less.

But the skin is not the only place where the blood which is leaving the brain may be found; some of it may be accommodated in the internal organs,

especially those of digestion. One has only to recall the sleepiness that many people experience after a full meal, the reason being simple, for the stomach in active digestion needs an increased amount of blood which it must withdraw from the brain.

In the last analysis it is the fall of blood-pressure in the vessels of the brain which is the vascular factor leading to somnolence, and therefore anything which reduces the pressure there tends to induce sleep. Thus, before an attack of sea-sickness blood is leaving the head, as is shown by the pallor of the face; most of us know that we feel decidedly sleepy before the vomiting occurs. Persons exposed to extreme cold become very sleepy through the enfeeblement of the heart devitalized by the low temperature. Old people, owing to the weakness of their brain circulation, often drop off to sleep, especially when tired and in a sitting posture.

It is noteworthy that Shakespeare makes no reference to the vascular factor

of sleep production, although, as we have seen, there are references to the other three.

The understanding of this source of sleep, the reduction of blood circulating through the brain, involves some knowledge of the fact of the circulation of the blood. Now it is just this knowledge which Shakespeare could not have, because he died twelve years before his great contemporary, William Harvey, announced the discovery in 1628. Gallant efforts have been made to prove that Shakespeare did know of the circulation of the blood, but I am firmly convinced after a detailed study of the subject that he did not know of the Harveian doctrine of the circulation. What he believed about the movement of the blood was only what Galen had taught, what had been expounded in the medical schools of Europe for 1,400 years.

It is extremely probable that the onset of healthy sleep is due to the co-operation of all the four factors we have been discussing. Thus, the mind being free

from too obtrusive thoughts and sensations, and there being a certain degree of brain fatigue, a fall of cerebral blood-pressure occurs and the person falls asleep.

The reversal of any of these four conditions—the psychic, the sensory, the fatigue, or the vascular—will induce the corresponding insomnia. Of course, any particular attack of sleeplessness may be due to the co-operation of two or more sleep-banishing factors. Thus, if a person is in a state of emotional unrest, this condition acts on the heart, stirring it up to increased effort with the result that an insomnia is produced which could have been produced by either factor alone.

Varieties of abnormal sleep related to vascular factor are fainting (syncope), and the unconsciousness brought on by compression of the carotid arteries, a method which has been successfully used to induce sleep in maniacs. The word carotid is from a Greek word "caros", deep sleep.

We must here allude to the devitalizing

effects of fatigue especially when coupled with sleeplessness. Both predispose to ill-health in that they reduce the resistance of the body to the onslaughts of the micro-organisms that cause disease. One expression of neuro-muscular fatigue in young people is the deterioration of handwriting. Some years ago, Dr. Dyke Acland read a paper at a meeting of the British Association in which he discussed the bad effects of lack of sleep on the handwriting of school-boys. He showed actual specimens of the writing, some done during a period of insufficient sleep and of noise in the dormitory, and others done after six nights of ten hours' sleep. A marked improvement in the handwriting was shown after only $7\frac{3}{4}$ hours' sleep per night but in a quiet dormitory.

It is very well known that some people are able to wake when they wish. They assign a certain hour to wake, and at that hour they regain consciousness. This faculty of unconsciously estimating time is an extremely convenient one.

While no dogmatic explanation can be given, the suggestion has been made that this power is an expression of the working of the sub-conscious mind. The additional supposition has to be made that the subconscious mind can take cognizance of the lapse of time. When so little is positively known about it, we may take refuge in a simile and say that the psychic, subconscious alarm-clock is volitionally wound up to go off at a certain hour, and that the mechanism "carries on" until the alarm is duly released.

Every now and again reports are made of persons, usually young women, entering upon very prolonged periods of sleep. This condition is called trance or narcolepsy. It is allied physiologically to hibernation or the winter sleep of animals. The word "trance" is the English form of "transitium", a going over, from "transire", to go across, a late-Latin but quite poetical expression for dying.

"Coma", a technical medical term, indicates a more intense form of lethargy ;

it is derived from the Greek "koimao", to hush or lull to sleep.

Some conscientious people have troubled themselves with the idea that perhaps they sleep too much. Cases of such prolonged sleep that the nervous system is damaged are very rare. The worries and excitements of modern life do not tend to permit most people to have too much sleep. Somnolence is constitutional, and often the result of a low blood-pressure. Most people hail the visit of sleep as a relief from the fatigues and worries of daily life, but if anyone is particularly anxious to remain awake, he may be reminded of the Spanish proverb—"Let him who sleeps too much borrow the pillow of a debtor."

Sleep or extreme somnolence is a feature of several disordered states of the body, but the word "sleepy" or "sleeping" has been employed in two notable instances as part of the designation of the diseases. "Sleeping Sickness" is the name given to a disease peculiar to Africa, the source of which has been

recognized to be a minute animal organism in the blood. The drowsiness is extreme. "Sleepy Sickness" is the result of the poisoning of the brain by a microbe of vegetable nature. It attacks the highest parts of the organ of consciousness, producing a lethargy. Curiously enough, young persons recovering from sleepy sickness are frequently found to have their mental and particularly moral character distinctly deteriorated.

The word "lethargy" has an interesting derivation, for it is derived from the Greek word "Lethe", the river of forgetfulness of the Infernal Regions. In a lethargy one lies like a log in complete oblivion of all around.

Only a passing reference is possible to the interesting subject of Incubation or Temple-sleep. This, which was practised both in ancient Greece and Italy, consisted in the patient, dressed in white, being made to go to sleep within the precincts of the sanctuary. Often a sleeping-potion calculated to excite dreaming was administered, and the priest would

interpret the dream, if any, in the morning. It was hoped that the dream might indicate some definite line of treatment.

SCHEME RELATING TYPES OF SLEEP TO INSOMNIAS AND OTHER STATES

Causal Factor	Types of Sleep	Related abnormal states of consciousness.	Related Insomnias.
I. Chemical.	Fatigue or exhaustion.	Chemical anaesthesia coma.	"Too tired" to sleep: athletes' toxaemia; in fever and due to drugs.
II. Absence of Sensations.	Negative, Sensory.	Hypnotic "trance."	Due to sensations, including pain.
III. Absence of Emotions and ideas.	Negative, intellectual.	Obsessions.	Due to mental activity (worries).
IV. Vascular.	Low blood-pressure.	Syncope (fainting): narcolepsy (trance).	Due to too high blood-pressure; rapid heart's action.

III

THE HYGIENE OF SLEEP

Much might be written under this head, but common sense would dictate the most of it.

It is an axiom of personal hygiene that the bedroom should have some direct communication with the outer air. We should be able to open the window if we find that we do not thereby chill the room to such degree that sleep is banished by the coldness of the air itself. A chimney in the room ensures ventilation even when the window is shut. Doubtless in a "dead" calm, no air is moving up the chimney, but the slightest breeze will draw air out of the chimney-pot and so cause the air in the room to be slowly

changed, which is the essence of ventilation.

The unventilated bedrooms of a past day have been responsible for much tuberculosis—a bedroom disease. Some of the holes under roofs and in dark corners where domestic servants have in times past been expected to sleep are hygienic outrages. If possible the bedroom should be a room to which the sun can get access on account of the sterilizing effect of sunlight. During the day, air and light should pour through the bedroom. Its dust should not be stirred up by a broom, but be removed by a vacuum-cleaner or a wet " duster ".

All these remarks apply with especial force to nurseries or rooms occupied by children ; the immune adult may come unscathed through conditions which would be very bad for children. Children in particular ought to be allowed plenty of time for sleep, and never be roused, for instance, from their slumbers to " do " lessons on an empty stomach before breakfast. In the schools of a past day

much hygienic cruelty of this kind was practised, doubtless through ignorance of elementary physiology. It was refined cruelty to tear growing children from their warm beds and make them dress there and then, often in the cold and dark, and then go down to a cold schoolroom where without food they were to proceed to "learn lessons" or "practise the piano". The schoolmasters and mistresses have also learnt some lessons since those days, so that schools are now, almost without exception, so well conducted on the lines of sound physiology that the boys and girls just "love" to return to school. Fifty years ago it would have been a bold prophecy to make that in the future the school-boy would be found going *willingly* to school.

As regards allowing plenty of time for sleep in the school time-table, the late Dr Clement Dukes of Rugby gave the following schedule.

	No of hrs. for sleep	*Time preferred* p.m.	a.m.
Children under 6 yrs.	13	6 to	7
Between 6 and 7 ,,	12.5	6.30 ,,	7
,, 7 ,, 8 ,,	12	7 ,,	7
,, 8 ,, 9 ,,	11.5	7.30 ,,	7
,, 9 ,, 10 ,,	11	8 ,,	7
,, 10 ,, 13 ,,	10.5	8.30 ,,	7
,, 13 ,, 15 ,,	10	8 ,,	7
,, 15 ,, 17 ,,	9.5	9.30 ,,	7
,, 17 ,, 19 ,,	9	10 ,,	7

For,

"The very "*worst*" way
To lengthen the day
Is to steal a few hours from the night."

we may be permitted to parody Moore by affirming.

That some eminent and highly intellectual men have been able to go through life with very little sleep is no precedent for the multitude. There have been some robust men of genius whom men of weaker clay must not try to imitate.

The hygiene of sleep resolves itself into the prevention and treatment of insomnia. Insomnia, from more or less

mechanical conditions, may first be considered. The mattress should, if possible, be what is called "springy". It must be admitted that there are some excellent wire mattresses which possess plenty of elasticity. The atrocious hygienic outrage of a feather-bed has been banished from decent society for ever. The mattress stuffed with feathers was unsuitable in every respect; it was absolutely devoid of ventilation, it allowed no animal heat to escape, and it was liable to get into lumps.

Owing to considerations of cleanliness, to sleep in sheets is preferable to sleeping in blankets; but in cold weather rheumatic people would be advised to sleep in well-dried ("aired") blankets. Blankets of a high degree of smoothness and pliability are now on the market. Sleep can be banished by there being too few clothes as well as by there being too many. Cold feet are a tantalizing source of sleeplessness. The ordinary rubber hot water-bottle may be used without any fear of being responsible for

chilblains. The liability to chilblains is constitutional; that is to say, those who are predisposed to chilblains will get them whether they use a hot water-bottle or not. It seems very absurd to waste several hours of the precious time devoted to sleep in waiting for cold feet to warm up.

But by far the greater number of cases of sleeplessness are due to psychic causes, a too active brain, as in writers, actors, men of science and thinkers generally. Some cases are, of course, due to emotional disturbances experienced shortly before bed-time. *Mrs Caudle's Curtain Lectures* are a classic instance of an inter-marital source of insomnia.

The principle underlying the treatment all these cases is the same, namely, to induce some blood to leave the brain by causing a determination of it to another part of the body.

We may first try to bring the unwanted blood to the stomach. A warm, digestible and not too large meal may be taken a short time before bed-time. Some

people find that going to bed when the stomach is empty is a cause of keeping them awake; they therefore eat a few biscuits kept beside the bed. A large glass of warm milk taken shortly before bed-time is an excellent soporific. People should always give this a trial before resorting to drugs. In a great many cases, a warm bath taken just before going to bed is all that is required to draw blood from the brain to the skin. In only a few cases does the hot bath so stimulate the heart that its rapid action keeps the would-be sleeper awake. The soothing and soporific effects of massage after a hot bath are well known to athletes. The hot bath and the massage together have the effect of warding off the stiffness and pain of the over-worked muscles. Even massage alone is an admirable sedative.

When a person is sleepless from trying to go to sleep in a stuffy room in which perhaps he has been working all day (a bed-sitting room; studio-bedroom; bed in the study), then a brisk walk in

the open air is often found all that is necessary. The exercise takes the blood into the skin and muscles and therefore away from the brain. In cases where sleep will not come easily owing to too little exercise having been taken, a nocturnal walk is often sufficient to put matters right. As to removing the causes of emotional insomnia, one cannot do better than quote the ancient exhortation —"Let not the sun go down upon your wrath."

The question is sometimes asked of a medical man whether one ought to sleep on the left or on the right side. If a selection must be made, it is possibly better to sleep on the right side, but not for the reason usually given. It is generally asserted that it is better to sleep on the right side because the stomach empties itself more easily in this position. The emptying of the stomach is not a postural affair at all; its own muscular contractions empty it quite independently of gravity. It is probably wiser not to sleep in any position which would

embarrass the heart's action; and the heart is on the left side. Many physicians are of the opinion that the child should be trained and encouraged to sleep in any position, on either side, prone or supine, as it prefers.

IV

DREAMING

A dream is the arousing of some degree of consciousness during sleep. It is the psychic result of some activity in a sensory centre during sleep. A dream is mental activity during sleep, hence in the profoundest sleep we do not dream. Inasmuch as we dream, we are tending towards the reviving of consciousness; and some dreams are so vivid as actually to wake the sleeper. It is believed that the majority of dreams occur during the time when sleep is becoming less and less deep; although we have abundant evidence that dreaming can occur during the converse process of falling asleep. The famous case of this is that of the man, who blew the candle out, and, having dreamt he had travelled round the world,

awoke to find the wick of the candle still red.

As physiologists, we have every right to assert that the physical basis of a dream is the functional activity of a part of a sensory cerebral centre. If we take the ordinary vision or dream in which the visual centre is involved, we shall have a concrete case before us.

In healthy sound sleep the centre for vision sees nothing because the eyes being shut, no nerve-impulses are reaching the brain from the retina. Physiologically, the dream of seeing something (visual dream) is due to the partial activity of the visual centre at a time when the rest of the centre is, as it should be, in repose.

When a centre is in activity at a time when its appropriate sense-organ is not, we call the result in consciousness a "hallucination". In plainer language, when we see something and there is nothing corresponding to the vision to feel or handle, we are experiencing a hallucination. The classical case of a

hallucination of vision in the waking state is the famous dagger of Macbeth.

A dream involving the centre for vision is, therefore, a visual hallucination : a dream of this kind is a sensation without that sensation having an external source.

Any dream is, then, the sensory hallucination of a sane person asleep. For there are hallucinations of the insane in their waking state, and very dangerous some of these may be.

Thus, Shakespeare's phrase, " the baseless fabric of a vision " is accurate ; the fabric is baseless because the dream has been produced by no visual stimulation.

In sleep, the eyes are closed and we are usually in the dark. But in spite of there being no stimulation by light, a vision is seen because only the centre is in activity. Otherwise put, the dream is central activity without activity of the retina, the appropriate end-organ. This sensation is hallucinatory. It should be understood that unless nerve-impulses traverse the visual centre, nothing whatever can be seen.

Still confining our attention to this centre, it may be asked, if the eyes are closed and we are in the dark, whence came the impulses that have aroused the centre to activity? The answer is, the impulses may have arisen in the skin and muscles, in the internal organs or in another sensory centre. Nerve-impulses which arise in the skin should, of course, proceed to the centre for registering cutaneous sensations, but that centre is asleep, and the impulses failing to enter it are shunted into the visual centre where they become the physical basis of a dream. Such impulses we call "aberrant", because they have wandered away from their own proper centre and reached the visual. They reach the visual centre because the paths into it are more accessible to impulses than are the paths into any other centre. This is because of the immense functional importance of the centre for seeing, because it is so much more constantly in use than any other sensory centre. Its activity means so much to our daily lives. More technically

put, there is a high degree of canalization or facilitation in the visual centre.

Currents or impulses which thus give rise to dreams may for convenience be called oneirogenetic (from the Greek *oneiros*, a dream, and *genao*, I produce).

Cases of this kind of dream are very common. Thus when the famous Dr Gregory went to sleep with too hot a water-bottle at his feet and dreamed that he was walking on the burning lava of Mount Etna, his visual centre had been stimulated by aberrant impulses from the skin. Changes in the temperature of the skin of the sleeper are very apt to be oneirogenetic, as when the bedclothes fall off and we dream we are in the Arctic regions, or when we have too much on the bed and dream we are scorched by a tropical sun.

A dream has come to be called a "vision" by reason of the fact that undoubtedly the vast majority of dreams are of seeing something : but the centre for hearing can also dream when sounds, voices or music may be heard.

When the stimulation of a centre by its own sense-organ produces the normal effect of activity of that centre, we call the dream an "appropriate" one; but when the centre is actuated by impulses which have not arisen in the related sense-organ, we call the dream "inappropriate". The vast majority of dreams of the visual centre are, in the nature of things, *in*appropriate, for from the closed eyes in the dark no normal stimulation of the visual centre can occur. The eyes are sense-organs which we can voluntarily protect from stimulation as when we shut our eyelids. We cannot, on the other hand, close our ears and so cut off all external sounds.

As all sorts of sounds are liable to be going on during sleep—and in modern life increasingly—and if they were all heard and correctly interpreted we should already be awake, so impulses set up in the auditory nerve are very liable to reach the visual centre and produce an inappropriate dream there. In other words, sounds, like touches, may produce visions.

In actual experience what very often happens is that when the auditory centre is primarily stimulated both it and the visual centre dream, so that we have a dream appropriate to the former but inappropriate to the latter. The following is an excellent example of this. The external sound was that of hammering, a car being repaired in a neighbouring garage one summer morning when the windows of the house were open. A lady, not sufficiently disturbed to be awakened, dreamt that she was one of a party at dinner in a restaurant and that she was annoyed by the presence of a woman at a table nearby who wore a bangle on her wrist which, every time she moved, struck her plate. Here the stimulus was sound, and the hearing centre was first aroused, but the visual centre was in full co-operation. There is no doubt that a person's own snoring can be the source of his dreams.

Both the appropriate and inappropriate type of dream is well described in *Romeo*

and Juliet where Mercutio says that Queen Mab, the fairies' midwife—

" gallops night by night

. . . . . .

O'er lawyers' fingers who straight dream on fees,
O'er ladies' lips who straight on kisses dream,

. . . . . .

Sometimes she gallops o'er a courtier's nose,
And then dreams he of smelling out a suit,
And sometimes comes she with a tithe-pig's tail
Tickling a parson's nose as a' lies asleep,
Then dreams he of another benefice :
Sometimes she driveth o'er a soldier's neck,
And then he dreams of cutting foreign throats,
Of breaches, ambuscades and Spanish blades,
Of healths, five fathoms deep, and then anon
Drums in his ear, at which he starts and wakes,
And, being thus frighted, swears a prayer or two,
And sleeps again."

The relationship between a particular stimulus and the subsequent dream was made the subject of experimentation many years ago by the Frenchman, Alfred Maury. When a pair of tweezers was made

to vibrate near his ears, Maury dreamed of bells, of the tocsin and of the events of June, 1848. When his lips were tickled, he dreamt that a pitch-plaster was being torn off his face by the old doctor of his childhood. Perfumes brought close to the nostrils induced dreams of pleasant smells, as when he dreamed he was in a conservatory, and on one occasion in a well-known scent shop in Cairo. When a drop of water was placed on his forehead, Maury dreamed he was in Italy in hot weather perspiring and drinking wine. Those dreams were more "appropriate" than one might have expected.

Occasionally a wholly appropriate visual dream is experienced, as when a man, not completely awakened by the rays of the rising sun, dreamed of seeing flames issuing from the mouths of dragons. One case is recorded where strong moonlight falling on the sleeper produced a dream of his embracing his lady-love—"the lady of his dreams", in fact. It has been suggested that rays of light falling into the eyes of persons in the coma of impending

death may have caused them to dream of bright beings—"angels"—and so waken them and make them speak of "heaven opened".

Hitherto we have considered as oneirogenetic only impulses arising in the organs of special sense, the skin and the muscles, what for convenience we call the ectoperiphery, but it is pretty well known that currents from the internal organs (entoperiphery) may be quite as effectively dream-producing. Doubtless, neither while awake nor asleep ought we to have any consciousness of the state of our internal organs beyond, of course, some hunger and a sense of well-being after a meal (coenaesthesia). But the most of us unfortunately know that in actual life this is far from being the case, for from time to time we are made painfully aware of our digestive and other internal organs. Now it is certain that impulses from the internal organs can become dream-producing. It is accepted on all hands as indisputable that a late supper will be sure to make us dream, and the "lobster salad" is

regarded as singularly effective in this respect. The inactive stomach does not obtrude itself into consciousness nor does the slightly active organ dealing with a normally digestible meal, but the increased muscular activity (peristalsis) associated with an indigestible meal taken shortly before going to bed may certainly produce dreaming of a highly unpleasant character. The old notion that digestion was suspended in sleep has been proved incorrect by Pavlow's observations on sleeping dogs. Clearly the dream following on indigestion is inappropriate, for impulses from internal organs are gaining access to the visual centres to which they are totally alien.

And so it is with the other internal organs, the intestines, heart, liver, gall-bladder and urinary bladder, to name only a few. If the activities of any of these become at all pronounced, the currents so aroused are extremely liable to be dream-producing.

When the disordered state of the heart is the causal condition, very distressing dreams may accompany the cardiac pain.

The physician is, of course, fully aware of these facts. He does well to warn his patients that after taking a pill they may have disagreeable dreams, for the increased muscular activity occasioned by the pill is often oneirogenetic. Colic is powerfully so. A full bladder particularly in children is almost certainly the source of dreams. The lungs, too, are sometimes oneirogenetic, especially when their bronchial muscle goes into the state of spasm (asthma).

All these dreams induced by abnormal states of internal organs are apt to become coloured with unpleasant emotion and so lead to incubus or nightmare, a state in which oppression, suffocation or the inability to move, walk or run is the hallucination. In pre-scientific days, the belief was that a female evil spirit actually sat upon the chest of the sleeper and overpowered or paralysed him. In Babylonian mythology, Labartu a horrible monster caused nightmare and certain ills peculiar to women. In nightmare and in all dreams which are highly coloured emotionally,

there is the tendency to irradiate. If the dream is in the visual centre, then the spread of nerve impulses is into muscles, including the heart, and into various glands in a manner which we must examine more fully a little later on.

Allied to nightmare are the night-terrors of children. *Pavor nocturnus*, as it is called in medicine, is a vivid and highly disagreeable dream produced usually by some abnormal state of an internal organ, often colic. What used to be called "growing pains" in children are certainly responsible for some of their nightmares. Growing-pains are now known to be an expression of rheumatism in the bones, for the growth of healthy bone is quite painless. It is probably true that if a child is at all often worried by "night-terrors", his nervous sytem may need critical attention, for some instability of it may be detectable.

We have seen that the visual centre is the one which most frequently dreams because of the greater degree of canalization of it than is found in any other centre.

But in the case of the congenitally blind, there can be no functionally educated visual centre, so that those persons must dream in terms of sensations other than visual. One blind boy dreamed of Alexander the Great by hearing guns firing, that is, he had a purely auditory dream. (The anachronism of guns in the time of Alexander must be pardoned.) A blind man dreamed that a relative was dead by his being conscious of touching a cold corpse. Another dreamed of the " Day of Judgment " by being pulled up to Heaven by a rope and hearing trumpets sounding.

Most dreams fade away with the rapidity with which they were born. Now and again, however, the dream-images are of such a character that emotions or ideas are aroused which in their turn are expressed through the appropriate physiological mechanisms. This sort of thing we refer to as the *dream overflow*. When the dream has become invested with strong emotional colouring, the dreamer may be awakened with all the symptoms of emotional disturbance—rapid heart action

(palpitation), trembling, perspiration, weeping, one or all of these. Such dreams are commoner in children than in adults, but are by no means rare at any time of life. The overflow of the nerve-energy may be into the heart, accelerating it, into the sweat glands and the tear glands, making them active, and into the body muscles, throwing them into a greater or less degree of tremor. This is the physiology of " to dream of the devil and wake in a fright " (*Ingoldsby Legends*), and of Macbeth's complaint of " these terrible dreams that shake us nightly ". A sensitive child may wake up screaming, with muscles all trembling and skin bathed in perspiration. The oneirogenetic impulses in the visual centre have overflowed into such cerebral regions as are the physical bases of emotion and of " meaning ", wherever these may be, and have so roused them that through the violence of the expression of the emotions the sleep has actually been terminated.

When the overflow from the dreaming centres is into the frontal regions, the

basis of the intellectual operations, then more or less definite ideas arise in the dream-consciousness. Occasionally the dreamer is amused by something seen or said in the dream and actually laughs, occasionally so loudly as to waken himself. Here the respiratory apparatus, particularly the diaphragm, is thrown into convulsive action. It is rare but not unknown to observe a sleeper smile in his sleep; healthy children may from time to time be observed to smile or laugh in their sleep.

Lastly, the dream overflow may be into the speech centres in the frontal lobes. The content of the dream may be such that it tends to induce words to be spoken, so that the cerebral speech centres are energized. The term somniloquence is sometimes used for talking in sleep. The words are usually incoherent and convey no meaning to an observer, but occasionally the words are full of significance, for people have been known to make important statements in the unconsciousness of sleep. Indeed, the old Latin adage, "in

vino veritas" may be paraphrased into "in somno veritas". In the dreaming that is accompanied by talking in sleep there is the same absence of reticence and abolition of conventional restraint as there is in alcoholic intoxication, so that the truth is sometimes inadvertently revealed in this manner. The novelists have not failed to make use of this knowledge, as when a murderer by talking in his sleep reveals important information about the crime he has committed, but in which his part is not suspected. We are here reminded of the Doctor's declaration in *Macbeth*—

"Infected minds
To their deaf pillows will discharge their secrets."

There is not the slightest doubt that we are entitled to assume that certain animals, for instance the dog, can dream.

We are approaching the condition of the acted dream in which, in consequence of the related emotions or ideas, there is a tendency to appropriate motorial expression. The talking and laughing in dreams

are of this exteriorizing quality. Occasionally a dreamer gets out of bed and proceeds to carry through a more or less complete and apparently rational series of actions. Such a person is called a somnambulist or sleep-walker. The tendency to sleep-walking is exhibited at an early age, and if it occurs at all frequently may be taken as evidence of some congenital instability of the nervous system.

This walking in sleep may, of course, lead the dreamer into some dangerous places, so that every now and again we read of persons falling downstairs or out of the window and so meeting their death. The movements of walking and the balancing of the body are carried out in complete unconsciousness, so that if a somnambulist happens to be walking in a dangerous place he can do so in safety, unaware of his peril. To awaken such a walker suddenly is the real danger. Sleep-walkers have been known to walk in safety over the roofs of houses and along the coping of a high wall, and not to fall over.

Since somnambulists are unconscious, nothing they may do in the state of somnambulism is regarded by the law as of criminal nature. Such a person might make a murderous attack on some other person, but the law would not hold him guilty, as there was no intent to kill or any subsequent recollection of the killing. For on awaking, the somnambulist does not remember what has happened while he was asleep. In this respect the state of the consciousness resembles that in the hypnotic trance. The ordinary or awaking consciousness has vanished, and a sub-conscious state been substituted for it. Writers of fiction have utilized these facts, since they are capable of highly sensational treatment.

Very occasionally persons asleep have risen from their beds and sat down to write something or to compose music as though in possession of full consciousness. Mathematicians have solved problems which had baffled them during their waking hours; poets have committed to paper verses that had "come" to them during

sleep; and there is at least one case recorded of music having been so composed. The musician, Tartini, is said to have composed his "Devil's music" ("Trillo del Diavolo") in this manner. This highly unusual form of brain activity (cerebration) is of the order of somnambulism in that it is the exteriorizing of ideas coherent and intellectual rather than the mere expression of a motorial compulsion.

Coleridge asserted that the poem *Kubla Khan* was composed in his sleep.

The term "somnambulism" certainly does not describe those intellectual operations. Not sensations but ideas are being recorded, and this intellectual process involves the muscles of writing: it might be called somnographia or, better, hypnographia.

Before leaving the subject of somnambulism, we might note that to walk or swim when sound asleep is not somnambulism. To walk asleep is not the same thing as walking in one's sleep. In walking when sound asleep no dream is being

enacted ; the walking is automatic through centres of the spinal cord acting independently of the sleeping brain. In walking in one's sleep, the subconsciousness of the dreaming brain is instigating the walking muscles to motorial expression.

We are now in a position to try to discover the characteristics of the dream state.

In the first place, it would appear that our notions of time and space are, for the time being, abolished. We do not seem to be in our normal relationships to external realities. We do not seem to have our usual standards of reference with regard to the past, present or future or to the ordinary limitations of space. The most noticeable obliteration in dreaming is that of the appreciation of the flight of time. Actions which would take hours, days or years to develop seem to occur with absurd rapidity, in fact in " no time ". Our familiar external standard of time is gone. The external world has been completely shut out and, as it were, forgotten, so that we do not seem to be related to any objective standards.

We behold a long-dead relative and even converse with him without the least astonishment that he has returned to life ; unmoved we see him exactly as we may last have known him a generation ago. In the dream we take everything at its face value, everything for granted ; we criticize nothing, are surprised at nothing, ashamed of nothing. There is nothing too absurd to be accepted at its own value, nothing too bizarre to astonish us. We are spectators of rather than participators in the weird scenes presented to our inward eye. The extreme *bizarrerie* is doubtless due to the extraordinary way in which the nerve-impulses must be wandering about undirected and uncontrolled in the sensory centres.

It is the power of criticism rather than the faculty of logical analysis that has been paralysed. The precise physiological reason for this may be the fact that those regions of the brain believed to be the material substratum of memory, judgment and the intellectual processes in general, are inactive, so that the hallucinatory

perceptions which constitute the dream are not subjected to that critical examination to which they would be in the waking state. The hallucinations are accepted as having all the validity of the reality of external things. The indispensable standards of time and space given us by happenings external to us are, for the time being, gone. We have no conscious relations to past, present or future, and are disoriented or not oriented at all to the limitations of tri-dimensional space. Our introspection is complete.

The dream is thus closely allied to the insane state in which the lunatic mistakes his hallucinations for happenings which possess a basis in external reality. The dream is emphatically not a succession of memory images, although some dreams are built up around a nucleus of such images. It has been remarked that the more intellectual the person, the less of mere memories will there be in his dream. Marie de Manaceïne remarks how very seldom a dreamer is confronted with his own image.

The ability to recall dreams varies from the greatest difficulty to the greatest ease. Sometimes on awaking we can scarcely recollect anything of our dream even when greatly desiring to do so, and at others we cannot forget it even if ever so anxious to do so. We may be "haunted by that dream" for days or weeks. The difficulty of recalling the usual sort of dream is no doubt due to the fact that the physical trace (engram) is so slight that the corresponding psychosis is very feeble. Whereas the dream we cannot forget has been one that aroused emotion, meaning or interest to such an extent that it acquired some element of stability. Certain dreams may be so vivid, so reasonable, and so sensible that a person subsequently may be heard to remark: "Did I see that or only dream it?"—eloquent testimony to the verisimilitude of the dream.

The tendency to-day is to regard the dream-consciousness as an emergence of the subconscious mind. Someone has said the discovery of the subconscious

mind by the late mystic and poet, F. W. H. Myers, was one of the great achievements of Victorian psychology.

This view accentuates the great differences between the waking consciousness and the dream consciousness. They are clearly different things; the one is by no means an extension of the other. To regard these as separate streams is to explain how, as a rule, what occurs in the one state is not remembered in the other. This has a parallel in the two aspects of personality, the *ego* and the *alter ego*; the one does not remember the deeds of the other.

Freud, as is well known, lays a great deal of stress on the contents of dreams and on their rising into consciousness when the inhibiting power of the latter has been withdrawn. Freud believes that many disagreeable and unpleasant memories are buried in our subconsciousness, whence they emerge during dreaming into the conscious realm. The dream may be regarded as a kind of half-way house between the subconscious and the con-

scious realms. The dream consciousness, not being subjected to the criticism associated with the perception of external reality, is more or less a law unto itself. From the analysis of the dream-content, Freud has derived a very great deal of the fabric of his psycho-analytic building.

According to Freud, the suppressed disagreeable or unsatisfied vicious desires or tendencies emerge from the realm of the subconscious usually under some kind of symbolic disguise.

While, of course, cases of this kind occur, it is equally true that very often in dreaming the disagreeable actualities of waking life are left behind, and for a brief space we survey, if not enjoy, "scenes that are brighter". The world forgetting, we live for a little, if not exactly in "the freshness", then in "the glory of a dream".

There seems no reason to doubt that persons while dreaming have received information of a more or less definite kind which was of vital import for them. This information is conveyed telepathic-

ally, or directly to the brain without having been communicated through any of the sleeper's organs of sense. From the earliest times messages, warnings, exhortations and revelations have come in dreams. When the future was divined through dreams in a systematic manner, the term "oneiromancy" was used. Some of these in our own day are quite remarkable.

One aspect of the dream we have not yet touched on is the so-called "atavistic". By this is meant that the dream is the expression of an ancestrally derived memory. The notion is, for instance, that dreams of flying or falling are subconscious survivals of the day when our ancestors were arboreal creatures and swung from branch to branch and leapt from the branches to the ground.

On similar lines—as unconscious or latent memory—is explained the kind of dream that we find shared, say, by father and son or by mother and daughter.

Cases of the familial dream are by no means unknown. That some dreams

are the expression of ancestral memories is an attractive theory. It assumes the inheritance of non-material, psychic traits in a subconscious manner, which is not by any means an extravagant hypothesis.

V

THE FUTURE OF SLEEP

We can quite understand one person to be found in *Who's Who* entering under "Recreations" the word "Sleeping". In some circumstances to be unconscious is as blissful as to be ignorant.

In the future, sleep will be recognized to be as necessary a bodily function as breathing, eating, drinking or excreting. A man's right to eat and drink—that is, to live—has always been admitted even by the most primitive and faulty system of laws. When a man steals food either because he is starving or his wife and children are, the judge deals very leniently with him.

In the future, sleep will be acknowledged to be just as suitable a subject for hygienic

legislation as food, drink or drains. The right of children in families of all social levels to unbroken rest will become more and more a self-evident proposition. The physicians at the " St. Andrew's Institute for Clinical Research " have some interesting comments on this subject in their fifth annual report. They remark that " certain infants brought up in noisy and unrestful surroundings fail to thrive in spite of the most careful regulation of their diet. On their removal to quiet and restful surroundings, improvement is at once manifest."

In the city of the future, any disturbance of the sleep of infants will be unthinkable. From the point of view of personal hygiene, insomnia will be regarded as seriously as asthma, indigestion or constipation. The right of all adult persons whatsoever to eight hours per night of tranquil repose in full unconsciousness will be admitted as inalienable as their right to exist. Sleep is not a privilege for the few—it is a physiological necessity for all. It is so much of a necessity that

it will supervene in spite of all things—hunger, wretchedness, the King's Regulations or the certainty of being hanged next morning. It is a capital crime in a military sense for a sentry to be found asleep at his post. But if "love laughs at locksmiths", then sleep spurns conventions and curses regulations.

Sleep is a psycho-physiological commandment, the twelfth commandment—"thou shalt not be found awake."

(About the eleventh, there seems some doubt; some authorities give it as, "Thou shalt not throw pearls before swine.")

In the scientifically planned cities of the future, there will be quarters where the hospitals and nursing-homes will be found together so that they may be most especially protected from all noise. It will be recognized by the civic authorities of that time that the patients must be able to sleep soundly at any hour of the twenty-four; and that the night-nurses be enabled to sleep soundly through the day. But indeed the whole

city will be so planned that the bedrooms of the houses will look out on quiet places not by accident but by design. Hitherto the town-planner or "city father" has not waked up to the conviction that sleep is not a luxury but an imperative function. At present we sleep how and where we can, usually in the midst of an auditory pandemonium contributed to by every kind of cacophony. We snatch at sleep as though it was something not only fugitive but interdicted.

The mechanically propelled vehicles of our modern traffic roar and scream and hoot and howl like prehistoric monsters in their death agonies. A front bedroom in a London house is a nocturnal phono-purgatory. The "sounding brass and the tinkling cymbal" of St. Paul are sweet melodies compared with the assaults on our ears which are nightly perpetrated in the interests of civilization. On Sundays, church-bells add their clangour to the din, and remind us that their use originated in attempts to drive away

devils; they have evidently not been successful. As night draws on, the extra heavy traffic deliberately increases in weight and volume. Vast furniture-vans rushing to and from the country boom along the streets shaking the very houses. Steam-engines of crude construction dragging trucks of cruder rumble along filled with very imaginable material, and the heavier the better.

Newsboys with "damnable iteration", in unintelligible accents, shout something about races or murders, for the details of which we could perfectly well wait until the worries of the next day have begun. In certain of the less fashionable streets, men selling fruit, fish and firewood from hand-carts bawl over these things with an intensity of purpose which would befit the drawing of our attention to the exhibition of the Koh-i-noor diamond. Nor can we be certain at any distance—even if we wish to be—whether they are selling fish, flesh or good red herring.

Railway whistles shriek, steamer sirens

yell, until one wonders whether these inanimate objects have suddenly come to life and are recoiling from the horror of it. Our neighbours on the other side of thin walls play the piano or practise the violin or French horn. The gramophone is "turned on" to the dismay of all who are outside the zone of distinct audibility. And when that grinder has ceased, the loud speaker of a nearby wireless transmitting apparatus is forced unwillingly upon our distracted attention. Apropos of grinders, we have to confess that the wandering, ape-accompanied Italian no longer attempts to charm us as formerly with his sequence of sweet sounds; nor do we now encounter the exiled sons of Germany, so far from the Fatherland, bringing, as they were wont, the music of that privileged country to our unmusical shores.

But the night advances, and the lower creation takes up the symphony. In the "silent" country, the dogs bark with alternate insistence, and in the city cats fight—or if it is not fighting it sounds

indistinguishable from it—with an earnestness that seems out of all proportion to the cause of the dispute.

Towards early morning the factory whistles issue their peremptory summons to end the insomnia; and if cocks have not crowed, it is because just here there are none to do so. Later, the milkman's boy, "light-hearted wretch", early as it is, "whistles as he goes".

We cannot but think of Thomas Carlyle's attempt to protect himself from his neighbour's poultry by making a room with double walls. Had his knowledge of the physics of sound been as penetrating as the noises he wished to exclude, he would have known that an air-filled space is a perfect conductor. That a sound-proof room can be constructed has been demonstrated by Professor Zwaardemaker of Utrecht who has constructed a room so perfectly sound-proof that the sounds of one's pulse-beats are actually audible in it.

At one time, the City of Berlin was a model for other places in the matter of

nocturnal tranquillity being ensured by civic authority. Anyone shouting, singing or whistling in any street after eleven p.m. was liable to be arrested. It seems that this rigour has been somewhat relaxed; but at any rate the outward quiet of German cities at night is a lesson to cities nearer home.

A certain amount of legislation will be enacted in the near future in the interests of sleep, legislation exactly comparable with that we already have in the interests of pure air, pure food and proper drainage. Noise will be regarded in the Public Health Acts as much of a Nuisance as are certain stenches in the noxious trades. So important a factor is sleep in its relations to the Public Health that in the near future it will be granted recognition by the Ministry of Health. In the laboratories of Public Health in the future, men and women will be researching into the psychobiology of the onset of sleep, into the nature of fatigue-toxins and into the causes underlying sleeplessness. In these

investigations the specially constructed vertically vibrating mattress will be employed to discover what is the precise reason for the sleep-producing power of this mechanism.

When the cause of the sleeplessness is that variety of asthma called "anaphylactic", it is suggested that absolutely dust-free, odour-free air, should be delivered to the interior of a specially constructed sleeping-cabinet.

The claims of brain-workers might now and again come in for a little civic recognition comparable with the trouble that is taken over the well-being of the labouring masses.

It is perfectly outrageous that in a street like St. James's, where intellectual people congregate, it should be necessary for a worker with his brain to have to go out into the street and formally charge an itinerant musician with creating a nuisance. Where a band of men are producing unwelcome sounds on "musical instruments", it should not be necessary for the distressed "party" to have to

prosecute personally, or at least be troubled to go to the police-court and "charge" the noise-producers. Some new bye-laws are necessary wherein the category of auditory nuisance is enlarged so as to include assaults on the sense of hearing. The police in the city of the future will have such increased powers that they will deal very effectively with cases of this sort. The same applies to dignified residential districts sometimes mis-called "quiet". In one of these, a person singing in the street can disturb an entire square in which the fretful child is being coaxed in vain to sleep, the tired mother anxious for rest, the weary invalid craving repose, and the busy brain-worker endeavouring to get some coherent ideas transferred from his consciousness to paper.

In the city of the future, in the interests of sleep these disturbances will be regarded with curiosity as examples of what were once permitted in a cruder and noisier age.

In that day men will crave for quiet

and enjoy auditory repose. Din and clamour will be considered not only wholly unnecessary, but as the expression of ugliness in relation to the sense of hearing. Just as now we protest more or less vigorously at having to live with what is ugly in a visual sense, so in that day sonorous ugliness will be quite as vehemently cursed. We remember the excusable furore when Rima, that outrage on the sense of visual beauty, was unveiled before a disappointed public, so in the city of the future will the ugliness of auditory assaults be as heartily anathematized.

Quite recently, Professor Spooner, speaking in public about "Preventable Noise and the Thinker", has reminded us that continuous noise was really fatigue-producing even though people believed they were getting accustomed to it. Professor Spooner referred to the noisy variety of music known as "jazz", with which we were assailed not only in places where they dance, but also in those where they eat. He said he liked to converse

with his friends in restaurants, but often found this impossible.

The very exasperating pneumatic drills for breaking up the concrete of the streets were also remarked on, and the serious depreciation in the value of house property in consequence of a district having become noisy. In the city of the future those things will not be. In the restaurants just as no one will be compelled to inhale someone else's smoke, so no one will be compelled to absorb someone else's noise. The streets will not be torn up, because, before they are laid down, thought will be taken for the hygienic morrow, and they will be planned on the lines of prescient engineering.

One problem in particular that will be looked into is the alleged relationship of the thyroid gland to sleep. The ascertained fact that this gland undergoes atrophy during hibernation may supply a clue for fruitful research.

The recondite subject of the hallucinations experienced during the transition time between sleeping and waking—the

so-called hypnagogic hallucinations—so much written about by the French author, Dr Leroy, will be studied in the interests of psychology. The subject of *dreams* will be looked into systematically both by physiologists and psychologists. By extending Maury's experimental method, a great deal of new light will be thrown on the physical aspect of Oneirogenesis. Similarly the psychical aspects of the problem will receive systematic and, as it were, expert attention. Hitherto, the subject has been largely in the hands of amateurs, of whom J. W. Dunne is so good an example. In his interesting book, *An Experiment with Time*, he gives much evidence that the content of certain dreams is that of events still in the future instead of in the past " experience " of the percipient.

Dreams will be viewed as the hallucinations of sane people asleep and as such will be investigated in a fruitful manner. The alleged telepathic nature of one class of dreams will be critically gone into, and some theory of dream-production

more satisfactory than we have at present will be elaborated. In particular, Freud's hypothesis of the production and significance of dreaming will be submitted to searching criticism. These workers in the future will try to grasp the alleged relations of dreaming to the personality as expressed either in the waking consciousness or in the so-called subliminal.

The entire Freudian system will be asked to justify itself. Here co-operation of neurologists, alienists and criminologists with the psychologists will be invited so that not only the medical profession but also the public may have some assurance regarding the value and permanence of the system associated with the name of Sigmund Freud.

The kind of research which has already been done in the United States of America may be regarded as the type of work to be done in the future. At Washington University, at Johns Hopkins University, at the Mellon Institute of Industrial Research, groups of young men and women have voluntarily submitted them-

selves to experimentation both as regards the measurement of the depth of sleep and as to the results of prolonged sleeplessness. For recording any movements of the sleeper, a specially constructed bed with a seismograph attached has been used. The periods of insomnia endured have ranged from forty to one hundred and fifteen hours. The many different kinds of tests familiar to workers in the psychological laboratory were employed to gauge the degree of mental vigilance. We have been supplied with a mass of physiological details showing in what way the deprivation of sleep affects the body, and stress is laid on the damaging effect of great fatigue upon the mental constitution. One writer remarks that there is a "veritas in fatigatione" as there is "in vino".

The following striking passage will be read with interest:

"The fact of disorganization of behaviour under conditions of fatigue and insomnia is utilized in the practice of the third degree examinations in American

police stations. The patient is kept awake and is questioned rather continuously through a comparatively long period, the theory being that his habits of behaving consistently with a manufactured story may break down earlier than his more stable habits. Just as the victims of the rack would make false confessions in order to end the torture, even though confession meant death by hanging or burning, so it may be expected that after two or three days of deprivation of sleep and continuous questioning in the third degree, the suspected criminal might testify to anything in the hope of being left alone. A colleague who has undergone a number of periods of experimental insomnia testifies that the discomfort he suffered is almost indescribable, and that his dread of future experiments exceeds his dread of any other form of physical pain."